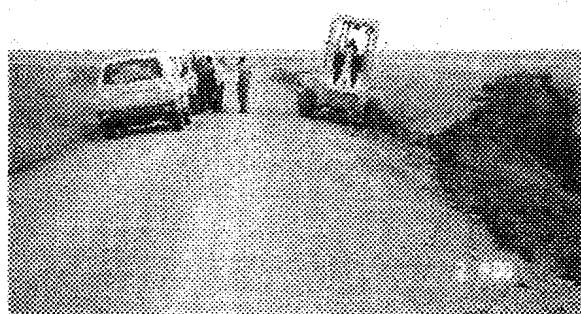
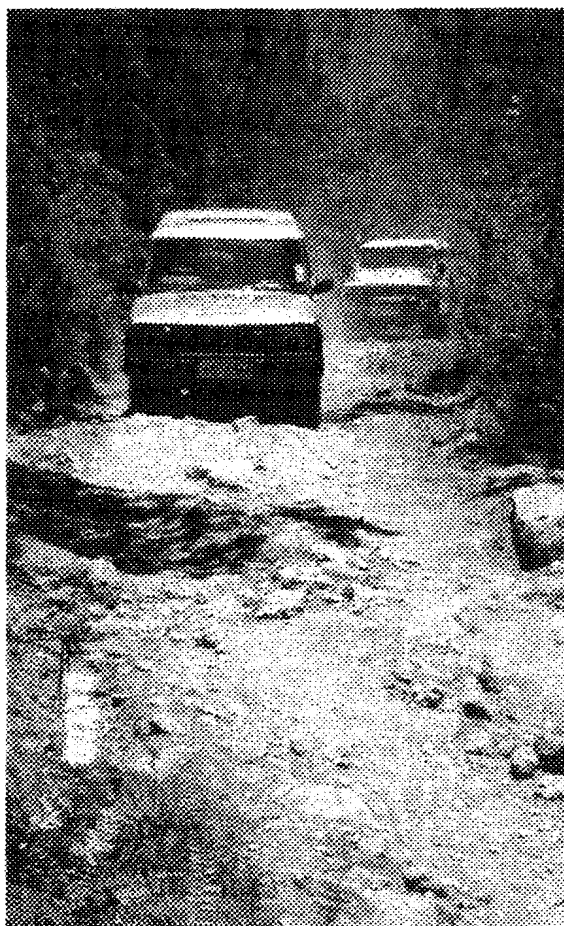


Summary

Programmatic Environmental Assessment for Road Improvements in Tanzania's National Parks



September 2001



US Agency for International Development
Bureau for Africa
USAID/Tanzania
USAID/RED SO/ESA and AFR/SD/ANRE



Programmatic Environmental Assessment for Road Improvements in Tanzania's National Parks

Prepared by

**Raphael Mwalyosi, Ph.D., Team Leader, Director Institute of Resource
Assessment, University of Dar es Salaam
Weston Fisher, Associate Team Leader, Senior Scientist, Tellus Institute,
and African Wildlife Foundation Consultant
Joseph Kessy, TANAPA Senior Park Planner
Emmanuel Gereta, TANAPA Senior Ecologist
Richard L. Engle, U.S. National Park Service Park Engineer
Ishael J. Varoya, Roads Inspector/Engineer, Serengeti National Park
Zafarani Athumani Madayi, EIA Specialist, Tanzania National Environment
Management Council
Alan Kijazi, Planner and EIA Specialist, African Wildlife Foundation**

For

**Tanzania National Parks TANAPA
USAID/Tanzania – Dar es Salaam, Tanzania**

The preparation of this PEA was supported jointly through funding provided by USAID/Tanzania to the African Wildlife Foundation and by USAID's Bureau for Africa Regional Economic Development Support Office (REDSO/ESA) and Office of Sustainable Development – Agriculture, Natural Resources and the Environment (AFR/SD/ANRE). REDSO/ESA and AFR/SD/ANRE funding was provided through EPIQ Task Order #35 Contract No. PCE-I-00-96-00002-00.

September 2001

**Tanzania National Parks (TANAPA)
USAID/Tanzania
U.S. Agency for International Development
Bureau for Africa REDSO/ESA and AFR/SD/ANRE
African Wildlife Foundation
EPIQ**

Foreword

This Programmatic Environmental Assessment (PEA) for Road Improvements in Tanzania's National Parks (TANAPA) was jointly conceived by USAID and TANAPA and motivated by TANAPA initiative and USAID regulatory requirements. In 1999, TANAPA secured funding from USAID for road equipment to be used in two of Tanzania's parks, Tarangire National Park and Lake Manyara National Park. However, funding was contingent on TANAPA following specific USAID environmental procedures governing the use of USAID monies for infrastructure work within National Parks and protected areas. These procedures also apply to situations where there might be adverse impacts on tropical forests, threatened and endangered species, biodiversity or sensitive habitats, or where potential exists for the introduction of exotic species of plants or animals. Since TANAPA's concerns and environmental impact assessment policy are essentially the same as those of USAID, TANAPA and USAID chose to join as partners in preparing the PEA. Tanzania's National Environmental Management Council was also interested in integrating Tanzania's Environmental Impact Assessment Policy with this USAID/TANAPA joint undertaking.

Readers desiring copies of this document may go to the Africa Bureau AFR/SD website at <http://www.afr.sd.org> and search under publications. In addition a contact list for key individuals involved in the development of the PEA may be found at end of this Summary.

Acknowledgments

This Programmatic Environmental Assessment (PEA) was conceived jointly by the Tanzania National Park Authority (TANAPA) and USAID with early involvement from the National Environmental Management Council (NEMC). The Team Leader was the Director of the Institute of Resource Assessment at the University of Dar es Salaam. A specialist in USAID environmental procedures served as the Associate Team Leader. Other team members included TANAPA's Senior Planning Manager, TANAPA's Senior Ecologist, a representative from NEMC, Serengeti National Park's Road Supervisor and Inspector, and a Road Engineer from the U.S. Park Service.

The entire effort was supported by Allan Kijazi of the African Wildlife Foundation (AWF), who handled all the logistical details for the PEA including the initial *Scoping* exercise, as well as the actual 4-week-long PEA field exercise which followed. Allan's background as a park planner, and his insightful comments and questions, also made him a valuable eighth member of the team. The entire team thanks AWF for coordinating this effort, and Allan in particular. Dr. James Kahurananga of AWF also provided important project oversight as a senior member of the AWF Arusha staff.

The list of those who helped make this exercise a success is long. To Charlotte Bingham, former USAID Regional Environmental Officer in Nairobi (REDSO/ESA) goes the credit for conceiving and helping shape the initial rationale and outline for the PEA. This PEA is part of her continuing legacy to USAID and TANAPA. She and Walter Knausenberger (USAID's current Regional Environmental Officer) provided the impetus for applying the concept of *Environmental Review* and the use of an *Environmental Screening Form* to individual proposed road improvement segments in Tanzanian National Parks. Joseph Kessy, TANAPA's Senior Planning Manager, readily embraced the need for the PEA as well as the philosophy of a joint USAID/TANAPA partnership in its execution. He played a key role in the PEA process, including initial *Scoping*, field assessment work, and the final preparation of the findings and recommendations which are contained in this report.

We also had strong support for this exercise from USAID/Tanzania, beginning with the Strategic Objective Team Leader for USAID's environmental program, Ron Ruybal, who secured the necessary funding under USAID/Tanzania's Strategic Objective Two: *Improved conservation of coastal resources and wildlife in targeted areas*. Gilbert Kajuna, as the Mission's Environmental Officer, not only participated directly in the *Scoping* exercise, but also was able to serve as a member of the PEA Team for our assessment work at Arusha and Kilimanjaro National Parks. The contribution of Yohannes Mulugetta also deserves recognition. As USAID's Team Leader for their Strategic Objective Five: *Rural roads improved in a sustainable manner*, Yohannes has helped to build a cadre of qualified private engineering firms and construction contractors who are now meeting USAID standards for road rehabilitation and maintenance. He reminded us that we should not overlook possibilities for taking advantage of such services in considering future road works within Tanzania's parks.

Pre-Scoping and the development of Terms of Reference for the *Scoping* exercise were supported by EPIQ/Tanzania through Management Systems International. Subsequently,

USAID/Tanzania asked the African Wildlife Foundation to serve as the USAID Partner who would coordinate the work. AWF generously assumed this role. Near the end of the exercise, USAID/Washington through the Bureau for Africa, AFR/SD/ANRE and REDSO/ESA contributed an additional 40 days to the Associate Team Leader's participation in PEA. Faye Camardo, Mark Stoughton, and Steve Bickel of Tellus Institute helped with final formatting, editing and proof-reading. The International Resources Group (IRG), a consulting firm based in Washington, leads a consortium of firms and institutions that provide environmental services to USAID and USAID's Bureau for Africa through the EPIQ Environmental Capacity Building Program. Tellus Institute is one member of this consortium, and Bob Winterbottom of IRG provided capable oversight of Tellus' involvement in the PEA, through the EPIQ coordinating mechanism.

Appreciation also goes to Chris Snipes of the U.S. Department of Interior for identifying, at short notice, the practical road engineering expertise of Dick Engle from the U.S. National Park Service. As a result we had Dick's presence as a PEA Team member for the full month of field assessment work. Dick also provided virtually all photos which appear in the PEA, as well as the Global Position System readings that accompany many of the photos. We must also thank Chris for the collaboration with Dana Cork, Bureau of Land Management Civil Engineer, and Dave Kruse, National Park Service Landscape Architect, both of whom were perceptive reviewers of the PEA Team's work. Gordon Keller, Geotechnical Engineer with the U.S. Department of Agriculture Forest Service, was also a very valuable external reviewer. Thanks also to USAID's Africa Bureau Environmental Officer, Carl Gallegos, for shepherding the *Scoping Document* and the draft PEA through the official review process, and for providing succinct comments of his own.

Esther Kerario and Paul Mtoni of the National Environmental Management Council (NEMC), both specialists responsible for Tanzania's Environmental Policy, provided advice during the early stages of PEA development. They also made available to us Ms. Zapharani Madayi, who served as NEMC's representative on the PEA Team.

We are grateful to other government officials for the time they spent with us defining the issues to be examined under the assessment — Emil Kayega, Principal Environmental Officer in the Department of Environment within the Vice President's Office; Amant C. Macha from the Tanzanian Tourism Board; Saleh A. Pamba, Director of Tourism in the Ministry of Natural Resources and Tourism; Erasmus Tarimo, Project Coordinator for the Wildlife Department; and Gisbert J. Kinyero, Acting Director for Policy and Planning within the Ministry of Works.

We received useful advice and counsel from various scientific experts as well, most notably Patricia McCauley, Environmental Impact Specialist with WEGS Consultants in Arusha; Alan Rodgers of the Global Environmental Facility in Arusha; Valeri Galanti, Wildlife Biologist with the Tarangire Conservation Project sponsored by the University Degli Studi di Milano and based in Tarangire National Park; Tim Corfield of Foxtrot Charlie Ltd. in Arusha; Silvia Ceppi and Malcolm Ryen with the Earth Fund (Italy); and Dr. Herman Mwangeni, WWF Program Officer in Dar es Salaam.

Other consultants who shared their expertise freely with us included: Mike Clapham of Roughton International; Dr. John Henshaw, Wildlife and Environmental Biologist and

Consultant, also with Roughton International; Winnie Mbagi, Flora Ismael and Habib Katove, all of Norconsult (Tanzania).

We are indebted to the 12 representatives of different tour operating groups under the Tanzanian Association of Tour Operators who met with us over a year ago in Arusha to provide their thoughts and useful suggestions on how to go about the PEA process.

Special thanks also to Jonathan Simonson, Managing Director of Tarangire Safari Lodge, for his insights on road-related environmental impacts at Tarangire. We also gained a greater appreciation of road issues associated with tourism from Charles Okoth, Assistant Manager at Lake Manyara Serena Lodge.

The PEA Team traveled over 2200 kilometers within Tanzania's Northern Circuit Parks, interviewing more than 40 members of TANAPA's staff. Throughout this exercise, again and again we met individuals, from Rangers to Wardens, whose admirable purpose, dedication, and pride in their Parks, provided us all with inspiration.

At Tarangire National Park, we were privileged to have David Dyauli, Tarangire's Road Inspector, and Jacob Porokwa, Tarangire's Community Conservation Warden, guide us through the field assessment — both men made themselves available for our Saturday trips to the northeastern sections of the park. Then, the Warden in Charge, Edward Lenganasa, and his staff assembled for a de-briefing by our team early on a Sunday morning.

At Lake Manyara National Park we encountered the infectious humor of Frank Silkiluwasha, Lake Manyara National Park's Chief Ecologist, who during *Scoping* met with us in his house on a Saturday morning when he should have been enjoying his family. On our return for the full PEA exercise, Frank served as our field guide. The dedication of the staff was fully evident at the Ranger level as well. During *Scoping*, we sat together outside one of the Ranger posts with Corporal Amini Mlabage, Private Fredrick Mbwambo, and Riziki Makange-Kibarua, obtaining their clear-minded perspectives on what they believed were the major issues associated with road improvements in the park.

Our de-briefing of the Warden in Charge at Lake Manyara, Marietha Lohay Kibasa, took place in the dark in the open meeting area near the old brick Lake Manyara tourist bandas. Mama Kibasa's concern for the future of her park shone at us, even as we fought off the mosquitoes. Despite the late hour, she was alert and engaging, asking us questions and offering discerning comments and suggestions which found their way into the PEA recommendations.

From Serengeti National Park we received willing support from the Warden in Charge, Justin Hando, who assigned us the fine talents of Ishael Varoya, his Road Inspector, as a PEA Team member for virtually the entire PEA exercise. At Arusha National Park, we were warmly received by the Deputy Park Warden in Charge, Simon Aweda, and then guided through the park by the Tourism Warden, Mary Jerome. Mary knew the park as though she had been born there, and her keen observations on the park's environmental problems made us think she should have been a team member for our entire PEA exercise. At Kilimanjaro National Park, we arrived to discover a major forest fire on the mountain. The extent and severity of the fire was clearly

testing the endurance of all the park staff, and yet we were graciously received and thoughtfully briefed by the Warden in Charge, Lorivi Ole Moriana. We were then escorted by his new Tourism Warden, Erastus Ufunguru.

On the last day of our field work, we found ourselves in Londorosi Village on the lower slopes of Mt. Kilimanjaro. The Village consists of small shacks thrown together with rough boards originating from the pines of the Forest Reserve. In one of these we were given a meal by a delegation of villagers, while they told us of their concern about the temporary bridge constructed to provide park visitors with access to Shira Plateau. The villagers asked if there might be a way to make their lives a little easier by upgrading the temporary bridge below the village so the village would not be cut off during the annual stream flooding. Driving back toward Arusha that evening with the snowcrown of Kilimanjaro turning gold in the sunset, we thought about the villagers' basic need, and how they might indirectly benefit from the increased tourism that would probably occur on that side of the mountain if the bridge and the road to the Plateau were upgraded. The villagers brought home the reality and value of our work — these were TANAPA stakeholders, eking out a living in a cold mountain environment. For all of us, for the villagers of Londorosi, for TANAPA and for Tanzania, environmentally sound road improvements matter.

On behalf of the entire team, we thank the Director General of TANAPA, Lota Melamari. His sincere personal interest in this exercise helped ensure that senior staff were freed from their more than full-time duties, some to serve on the team, and others to provide expert advice during the field assessment work. These included key staff at Park Headquarters like Emmanuel Gereta, TANAPA's Senior Ecologist, as well as important engineering and ecological personnel at each of the Northern Circuit parks.

The Director General put aside all pressing commitments three times for us — twice to be briefed prior to the PEA field exercise, and again at the conclusion of field work to discuss the recommendations put forward in the PEA draft. His penetrating grasp of the most important recommendations convinced us that the final products of the PEA will become living documents. We believe this is especially true for the environmental procedures and mitigation measures that will be used to improve how TANAPA plans, designs, constructs, rehabilitates, and maintains the road and trail networks for all the parks. With the direction and impetus of the Director General, and the observed dedication and pride of his staff, we believe this PEA will be of lasting benefit.

Raphael Mwalyosi
Director
Institute of Resource Assessment
University of Dar es Salaam

Wes Fisher
Tellus Institute
Boston, Massachusetts

April 2001

TANZANIA NATIONAL PARKS



KEY



NATIONAL PARKS



INTERNATIONAL AIRPORTS

Acronyms

2wd	two-wheel drive vehicles, including most tour buses
4wd	four-wheel drive vehicles, e.g., land-rovers
AFR/SD/ ANRE	USAID Bureau for Africa, Office of Sustainable Development - Agriculture, Natural Resources and Environment
ANAPA	Arusha National Park
AWF	African Wildlife Foundation
BEO	Bureau Environmental Officer
BEPs	Best Engineering Practices
BLM	U.S. Bureau of Land Management
CCS	Community Conservation Service
CCW	Community Conservation Warden
CFR	U.S. Code of Federal Regulations
DALP	TANAPA Development/Action/Lease/Procedures
DOI	U.S. Department of Interior
EIA	Environmental Impact Assessment
EPIQ	A USAID Environmental Indefinite Quantity Contract to provide technical assistance and training in environmental/natural resource policy and management
ER	Environmental Review
EU	European Union
FAA	Foreign Assistance Act
GDP	Gross Domestic Product
IEE	Initial Environmental Examination
kms	Kilometers
LAU	Limits of acceptable use — planning concept applied to TANAPA Parks instead of the less workable concept of carrying capacity
LMNP	Lake Manyara National Park
MEO	Mission Environmental Officer

MZP	Management Zone Plan
NPS	National Park Service
NEMC	National Environmental Management Council
PEA	Programmatic Environmental Assessment
REDSO/ESA	USAID Regional Economic Development Support Office/East and Southern Africa
REO	Regional Environmental Officer
SCDP	Serengeti Conservation & Development Project
SNP	Serengeti National Park
SO2	USAID Tanzania Strategic Objective 2: Improved conservation of coastal resources and wildlife in targeted areas
SoW	Scope of Work
TANAPA	Tanzania National Parks
TCMP	Tanzania Coastal Management Plan
TNP	Tarangire National Park
ToR	Terms of Reference
URI	University of Rhode Island
USAID	United States Agency for International Development
WIC	Warden in Charge
WWF	World Wildlife Fund

Summary

Tanzania's National Parks contain some of the world's most diverse ecosystems, treasured because of their wildlife concentrations and rare beauty. The number of visitors and vehicles entering the parks has been increasing at a dramatic rate in recent years, as has the contribution of the tourism sector to Tanzania's economy. These trends are expected to continue. Tourism has risen from 3% of GDP in 1996 to 18% in 1998, and is projected to reach 25-30% in 2010.

Direct benefits to TANAPA from road construction/rehabilitation are expected to be considerable, including more timely, efficient and enjoyable visitor access to various parts of the parks, and longer tourist stays. Potentially, establishing new roads and facilities outside the high-use zones should also relieve pressure on the resources in core zones. This form of development, in turn, may result in increased park revenues needed for sustainable management, without adversely affecting ecological systems, the quality of visitor experience or exceptional resource values.

Road improvements may also be critical for improving anti-poaching and park enforcement operations, as well as in providing improved mobility for Community Conservation Service (CCS) activities.

In response to increased park accessibility, TANAPA revenues are expected to grow. A sound financial position for TANAPA will also mean more revenues contributed to central and local governments, as well as improved local economies, life styles and social services for communities adjacent to the parks.

“Roads vs. no roads.” TANAPA must grapple with a philosophical question in considering the role roads will play in the future of Tanzania's parks. The PEA Team moved through many areas with beautiful vistas, unmarred by human presence. These Park resources are growing rapidly in value as “wildlands” shrink globally. While the construction of new roads can in many cases be accomplished without diminishing biodiversity and with minimal impacts on the environment, their impact on wilderness quality and viewsheds is not negligible.

Clearly, improved roads and a good road network contribute to increased park revenues, so vital to ensuring that the parks can continue to be effectively managed and their resources protected. The effects of insufficient revenues on Tanzania's parks have been evident historically. Whenever revenues decline, park management suffers. Yet because of the rapid increase in value of Tanzania's parklands, greater consideration may need to be given to restricting visitor access to areas with no roads, and to “banking” more of these unspoiled areas for future very low impact tourism.

If tourist demand to visit the parks continues to rise exponentially, perhaps instead of opening new areas to roads, more thought should be given to holding down the number of vehicles and visitors entering the park, through a general upward adjustment in park entrance fees and bed levies. This would keep revenues high while also allowing TANAPA to keep the number of visitors within established Limits of Acceptable Use (LAUs). Higher fees might also be charged for the opportunity to visit areas with exceptional resources.

Alternatively, TANAPA could adopt a policy of providing only minimal tracks in areas currently designated for future development, such as the western side of Tarangire or the northern Serengeti. By doing so, the road could be easily abandoned and the area in question returned to a natural state if, in the future, Park Management were to decide that the value of the unspoiled resource was greater than the revenues generated by visitors. However, as most planners involved in conserving natural areas know, closing a well-traveled road is not easy. Once a road is constructed, it develops a history of its own. Efforts to remove it often make little sense to the next generation of park managers and visitors who come to believe "*it was always there.*" It bears remembering that the benefits of opening up new areas to roads, in order to relieve pressure on more intensively used park zones, is not without cost. The impacts may not be severe, but they may still be irreversible.

From a strategic perspective, planned road improvements must take place within the context of TANAPA efforts to set and enforce *Limits of Acceptable Use* for each National Park. Unplanned growth in the number of visitors entering the parks and traveling on park roads, would lead to an incremental, disconnected or opportunistic approach to the development and maintenance of the road systems. Over a span of only a few decades, cumulative effects would contribute to undesirable deterioration in physical and ecological systems, declines in biodiversity, threats to rare and endangered species, declines in the quality of the visitor experience and, ultimately, a drop in park revenues.

On the other hand, through strategic planning, it appears possible in a number of parks to add to the road/trail network without jeopardizing biodiversity or exceptional resource values. Under well-conceived and managed road and trail network plans, the potential exists in several parks to add new and upgraded visitor access, especially to areas further from established lodges and camps. Improved networks could help relieve current pressures on core preservation zones, while allowing a larger number of visitors to enter the parks each year. This assumes, however, that steps are taken to ensure LAUs for each zone are not exceeded. It is suggested that the responsibility for establishing road/trail network plans for each park ultimately lies with the TANAPA Planning Unit, in close consultation with the Chief Wardens in Charge for each park.

Developing the *Scoping Statement*. When a PEA or an EA is prepared, the originator of the action, in this case USAID/Tanzania and TANAPA, begin a process of identifying the significant issues related to the proposed action and determining the range of issues to be addressed in the PEA or EA. Known as "*scoping*," this process involves full consultation with stakeholders, including a range of all affected parties. The *Scoping* exercise was carried out from 28 November through 19 December 1999.

The draft *Scoping Statement* was provided to USAID/Tanzania, TANAPA's Planning Unit, the National Environmental Management Council, USAID's Regional Environmental Officer (REO), and the USAID Africa Bureau Environmental Officer (BEO). The BEO distributed the *Scoping Statement* for comments to other USAID offices and U.S. Government departments and agencies, including the Department of Interior, Bureau of Land Management and the U.S. Forest Service. A period of approximately 4 weeks was provided for review and approval prior to initiation of the PEA.

The draft *Scoping Statement* was subsequently reviewed by the PEA Team and the final version, together with comments from the reviewers of the draft, is provided in the PEA *Appendix A: PEA Scoping Statement*.

The PEA process and methodology. PEA Team selection occurred after review of the *Scoping Statement*, in order to ensure that the team would have the necessary mix of skills needed to address each key issue identified during *Scoping*. The full Team worked together over a period of approximately 4 weeks, from January 31 through March 3, 2000 and consisted of the following individuals:

Team Leader, Professor Raphael Mwalyosi, Institute of Resource Assessment, University of Dar es Salaam;
Associate Team Leader, Wes Fisher, USAID/African Wildlife Foundation Consultant;
Senior Planning Manager, TANAPA Planning Unit, Joseph Kessy;
Senior Ecologist, TANAPA, Emmanuel Gereta;
Road Inspector, Tarangire National Park, Ishael Varoya;
Civil Engineer, National Park Service, U.S. Department of Interior, Richard Engle;
EIA Specialist, National Environmental Management Council, Ms. Zafarani Madayi;
EIA Specialist and Planner, African Wildlife Foundation, Allan Kijazi.

Brief Biographical Sketches of the PEA Team are provided in Chapter 9 of the PEA.

Using the *Scoping Document* as guide the results expected from the PEA included:

- 1) a process and management structure for environmental screening and review of TANAPA roads;
- 2) general environmental criteria and guidelines for proposed road activities in National Parks, that TANAPA can use to determine the appropriate level of environmental analysis for park roads, what criteria/guidelines/standards to follow, and how to make appropriate environmental decisions;
- 3) capacity and awareness building that strengthens EIA, sound environmental design, and improved management of TANAPA roads;
- 4) effective mitigation at the various stages of road improvements, including planning and design, construction, operation and maintenance, and decommissioning (abandonment);
- 5) an environmental management plan outlining, among other things, responsibilities and timelines for mitigation and monitoring;
- 6) a set of guidelines and best engineering practices for environmentally sound design and implementation of road improvements; and
- 7) specific information pertinent to USAID-supported roads so that road activities can be implemented in compliance with USAID environmental procedures.

Because of limitations on time and resources available to carry out the PEA, the Team was not able to survey all of Tanzania's National Parks. Instead, TANAPA chose five Northern Circuit parks for examination which they believe provide a representative sample of the types of roads and physical and ecological conditions found throughout the entire Park System: Tarangire National Park (TNP), Lake Manyara National Park (LMNP), Serengeti National Park (SNP), Arusha National Park (ANAPA) and Kilimanjaro National Park (KINAPA). (See the map on page 6 for relative locations of these five parks.) The Team made an effort to assess environmental impacts for all TANAPA road classifications and types of road improvements,

under a full range of geological, soil, meteorological, topographic and ecological conditions existing in the parks. Approximately 2200 kilometers of park road was observed by the Team.

Programmatic Environmental Assessment Results. The results from this PEA include a set of environmental procedures for screening of various categories of proposed road activities, and for conducting environmental reviews of proposed road construction, rehabilitation, realignment, operation and maintenance, and decommissioning, over which TANAPA has responsibility. These procedures are provided as a separate stand-alone document entitled *TANAPA Procedures for Environmental Reviews of Road Improvements*.

Typically, environmental assessments provide long lists of mitigation and monitoring recommendations; however, the preparation of these lists consumes the bulk of the assessment level of effort, and the end result is that assessments often contain little or no guidance on how to implement the recommendations. The Team has therefore prepared a second stand-alone document entitled *TANAPA Environmental Management Plan Guidelines for Road Improvements*. These *Guidelines* provide the guidance needed for preparation of annual *Environmental Management Workplans* at the park level that can be used to describe who will be responsible for implementing the various recommendations, how and when actions will be taken, and estimated time and cost requirements. Both the *TANAPA Procedures for Environmental Reviews of Road Improvements* and the *TANAPA Environmental Management Plan Guidelines for Road Improvements* are discussed in more detail below.

In addition, the PEA helped TANAPA begin developing environmental criteria and standards for all National Park roads. The exercise also strengthened TANAPA's capacity to conduct environmental impact assessments.

In carrying out the assessment, the PEA Team felt it was necessary to develop a common road classification system that would be consistent with both the system developed under the Serengeti Conservation and Development Project financed by the European Union (Norconsult, June 1997), and a proposed classification system for Tarangire National Park found in *The Draft Road Assessment Report for Tarangire National Park*, conducted by the U.S. Department of Interior (1998). The classification system used by the Team is provided below.

**USAID/TANAPA Programmatic Environmental Assessment Standardized Road
Classification System for Tanzania National Parks**

ROAD USE	CLASS	DESCRIPTION	AVERAGE TRAVELED WIDTH
Major Access	Class I	Cambered, ditches, turnouts, murram surfacing, full 2-lane traffic, all-weather 2WD; roads are shaped and cambered, have drainage ditches and turnouts for removing water from roadway, and have been surfaced full length with murram	7 m
Minor Access	Class II	Cambered, ditches, turnouts, murram surfacing, 1-lane with room for slow speed passing, all-weather 2WD; roads are shaped and cambered, have drainage ditches and turnouts for removing water from roadway, and have been surfaced full length with murram	4.5 m
Minor Access	Class III	Cambered, ditches, turnouts, 1-lane with room for slow speed passing, all-weather 4WD; roads are shaped and cambered, have some drainage ditches and turnouts, and have limited amount of murram at soft spots	4.5 m
Game Viewing	Class IV	Cambered, ditches, turnouts, 1-lane, may not be accessible at all times, 4WD; roads are shaped and cambered, have some drainage ditches and turnouts, and have limited amount of murram at soft spots	3 m
Game Viewing	Class V	No camber or shaping but could be lightly graded, 1-lane, not accessible during wet season, 4WD, basically 2-track	3 m
Administrative	Class V	No camber or shaping but could be lightly graded, 1-lane, not accessible during wet season, 4WD, not open to visitors; basically 2-track	3 m

A Road Done Right—A Grader Operator Who Knows His Art



In the Serengeti, this Class I road from Naabi Hill Gate to Seronera was well-maintained, with a good murramed and cambered surface. Using a grader, a newly cut runout drain had just been completed to the right. Knowing how to use the grader to shape park roads is a skill not acquired from manuals. Finding an operator who is also an "artist with the grader blade" is the secret! (S 2°38.5', E 34°54.2')

Proposed Action and Alternatives. This PEA examines a representative set of proposed road improvement actions of interest to TANAPA in all of Tanzania's National Parks. It also meets USAID's specific requirements for an assessment of representative actions that may be undertaken using USAID-funded road equipment in the parks, specifically in Tarangire and Lake Manyara National Parks, where USAID support is being provided under USAID/Tanzania's Strategic Objective — *Improved conservation of coastal resources and wildlife in targeted areas (SO2)*. For TANAPA's purposes, the PEA is more comprehensive than required under USAID environmental procedures. However, it also meets the requirements of USAID's 216.6(c)(3).

Chapter 2 provides information required by USAID's 22 CFR 216(c)(3) and TANAPA regarding the review and comparison of the proposed action and alternatives in the following order:

- description of the proposed actions;
- description of alternatives to the proposed action, including the no action alternative;
- comparison of the proposed actions and alternatives;
- identification of the preferred alternative, including mitigative measures, not previously included in the proposed action or alternatives.

Description of proposed actions. As mentioned above, the PEA Team examined proposed road improvements in five of Tanzania's northern parks which TANAPA believes provide a comprehensive sample of the types of improvements likely to be undertaken in all parks under varying physical, ecological, landscape and socio-economic conditions. The types of improvements are summarized park-by-park in Chapter 2, Sections 2.1.1 through 2.1.5. The road classification outlined above is used in this discussion.

On the basis of observations in the five parks, proposed road (or trail) improvement actions in all of Tanzania's parks, including Tarangire and Lake Manyara National Parks, are expected to include new construction, realignments, major upgrades, road rehabilitation, routine operation and maintenance, and decommissioning. Virtually all work will be performed using park equipment and equipment operators and common laborers under the supervision of park Works Department personnel. New roads can be Major 2wd (Class I) and Minor Access 2wd (Class II) murramed all-weather surfaces; or Minor Access 4wd (Class III) or Game Viewing roads 4wd (Class IV) — both with limited application of murram at soft spots. New roads may also fall under the category of Game Viewing and Administrative Roads (Class V) which are not accessible during wet seasons, receive little or no grading, and are left unmurramed. TANAPA policy prohibits the use of tarmac (asphalt) for road surfacing, except under exceptional circumstances. Thus, tarmacking of roads is not considered under the PEA.

Construction of new roads or realignments:

During the construction or realignment of roads, trails or firebreaks, the following activities are expected:

- preliminary multidisciplinary survey on the route;
- establishment of equipment workshop support;
- establishment of construction camps;
- location of murram supply and quarries;
- route clearance, including the removal of bushes, trees, stones, and topsoil;
- construction of water crossings using culverts, drifts, and bridges;
- construction of drainage ditches, and runout drains for removing water from the road or trail surfaces;
- shaping the road to form a cambered surface;
- avoiding the creation of berms along roadsides which could result in water being channeled down the road;
- watering and compaction of the subgrade soil;
- trucking and application of murram on the road or trail as needed;
- cutting and filling;
- spreading, watering, and compacting layers of murram;
- storage of fuel and lubricants;
- waste management.

Rehabilitation, upgrading and routine operation and maintenance:

Activities expected in the National Parks during rehabilitation and maintenance are similar to those for construction although less clearing of vegetation is typically required. The more significant actions are associated with:

- maintenance of runout drains and ditches;
- restoration of road camber and shaping to control the flow of water over road surfaces;
- removal of berms from road sides to prevent water from being channeled down the road;
- widening existing roads;
- continual road maintenance through murrum application;
- dust control;
- maintenance of machinery;
- management of wastes and vehicle pollutants such as petrol, diesel and lubricants;
- efforts to control the spread of exotic species;
- management of vehicle traffic movement, off-road driving and tourist activities.

Road improvements entail upgrading most of the roads to designated standards. In many cases, this involves grading, cambering, cutting and filling, chanelization and heavy use of murrum.

Decommissioning:

Unlike most rural roads, there are a number of roads and trails within Tanzania's National Parks that have been abandoned and/or are candidates for decommissioning. Re-alignments also require decommissioning of old roads and trails. Well-planned decommissioning can be expected to improve viewshed, scenic quality and visitor experience, while also reducing the effects of soil erosion. Key activities include:

- ripping the old road/trail surface;
- revegetation using indigenous flora;
- application of techniques to prevent erosion through shaping.

Management and implementation actions. TANAPA organizational structure places prime responsibility for road improvements with the Warden in Charge for each National Park. Thus, decision-making is decentralized and decisions on improvements are made through a roads committee established by the Warden in Charge and consisting at a minimum of staff within the park responsible for road works (including construction and maintenance). The PEA calls for the establishment in each park of an Environmental Management Team for road improvements, each led by a park Environmental Review (ER) Coordinator. The Team's responsibility is to ensure that environmental review, mitigation and monitoring occurs in a systematic and timely fashion for road improvements for all proposed road segment activities. Members should include a roads engineer, roads manager/inspector and/or roads foreman for road works, and a park ecologist or an individual with training in environmental review and analysis, mitigation and monitoring. It is anticipated that under most circumstances, the park ecologist will be the person chosen by the Warden in Charge to serve as the Environmental Review Coordinator.

Most decisions on improvements are made during development of annual workplans which are used in annual budget submission justifications (typically during May and June). However, decisions may also be made during the year based on unforeseen circumstances and changes in park management priorities. The PEA recommends that all improvements be subjected to TANAPA's environmental screening and review process, with signed copies of completed reviews submitted to TANAPA's Planning Manager. In the case of Tarangire and Lake Manyara National Parks, reviews will also be submitted to USAID/Tanzania's Mission Environmental Officer.

The TANAPA Planning Manager and Planning Unit staff responsible for environmental impact assessment will also require review of significant road construction and realignments. For improvements of this magnitude in Tarangire and Lake Manyara National Parks, review is also required by the USAID Mission Environmental Officer, who determines whether an environmental assessment must be carried out in conformance with 22 CFR 216. The *TANAPA Procedures for Environmental Reviews of Road Improvements* include guidance for park personnel on when review by the TANAPA Planning Manager is required.

Alternatives to proposed actions. Few alternatives are available to perform the same functions as park roads. In most situations, alternatives to roads are neither practicable nor economically viable. However, before constructing new roads or road alignments, or carrying out major rehabilitation or upgrading of existing roads, environmental review of proposed road improvements must consider whether other alternatives might be appropriate and cost-effective. Depending on circumstances, alternatives deserving consideration might include: walking trails; air transport; use of specialized off-road driving and "swamp buggy" equipment; or use of motorized wheelbarrows and all terrain vehicles for mountain rescue and movement of supplies. In special cases, rail or water transport may be appropriate. Because information regarding the costs and feasibility of these alternatives relative to specific proposed road improvements cannot be considered in detail for every park, they are dealt with conceptually under Chapter 2, Section 2.2.2. The no action alternative is defined below.

The no action alternative. Within an EA or PEA, the alternative of no action must be addressed. The no action alternative is generally defined as meaning that the proposed activities do not take place. The resulting environmental effects from taking no action are compared with those that would occur as a consequence of the proposed action or alternatives to it.

Under the no action alternative conditions should not be considered unchanging or fixed. In fact, no action can result in significant adverse or beneficial impacts over time, which should, where prediction is feasible, be compared to both the proposed action and other possible alternatives, to determine whether the proposed action is truly the preferred alternative. Sometimes existing conditions are used as an approximate no action measurement (proxy) when major changes are not anticipated and the future is likely to be much like the past.

For the purposes of this PEA, the no action alternative is defined as the continuation of the *status quo* with respect to road construction, operation and maintenance, and decommissioning. In effect this means little new construction, and continued inadequate maintenance. The consequences are considered in the PEA for each of the parks in Chapter 2, Section 2.2.1.

The design of road infrastructure in almost all parks in Tanzania has been ad hoc. Proper road surveys have generally not been undertaken which take into account soil characteristics, topography and contours. Many roads and tracks are in a poor state, and their condition worsened following the 1998 El Niño rains. Under no action, road infrastructure would deteriorate further, and runout drains would continue to be clogged or overgrown. Continued improper road grading can be expected, creating road surfaces below the surrounding land area, soil berms along roadsides that prevent proper drainage, and uncambered roads which fail to keep vehicle wheels away from water during rain. The expected results are high erosion, rutting and gulleying of sloping road surfaces and accumulation of water at low points in the roads and in ruts. Uncontrolled water will also continue to flood areas adjacent to roads, and bridges may deteriorate further or collapse. Wetlands would be subject to siltation due to lack of controlled drainage and erosion.

Vehicles using deteriorating routes would continue to drive off-road to avoid ruts, standing water and gulleys, creating cumulative soil erosion impacts, loss of vegetation on adjacent lands, and causing further deterioration in aesthetics.

Without road improvements there would be decreased access to park resources, impaired visitor experience, and declines in park revenues. In addition, anti-poaching activities would be hampered as a direct consequence of road deterioration and lack of maintenance.

Under no action, the expense and difficulty of road rehabilitation and maintenance would increase. A good example is the Shira Road in Kilimanjaro National Park, which has deteriorated to a point where rehabilitation is almost impossible. Similar deterioration was observed on some trails. Under such circumstances, realignment with decommissioning of old routes may be less costly than rehabilitation and continuing maintenance.

Under the status quo, environmental design considerations for new road segments would receive minimal attention. Surveys to select preferred routes that follow contours and minimize soil erosion and viewshed impacts would generally not take place. Inadequate emphasis would be given to evaluating the overall costs and benefits of transportation alternatives (e.g., roads versus walking trails).

Alternative design and maintenance strategies for road improvements. TANAPA's General Management Plans and Management Zone Plans are very valuable tools for evaluating both the existing road networks and the planned development of new roads. TANAPA's use of these documents can help guide the type and level of road improvements anticipated over the next five years. However, they are not sufficient by themselves. Park-by-park analyses of roads and trails need to be carried out to determine the most environmentally sound routings. At the same time, TANAPA assessments need to be conducted to select the most cost-effective and environmentally sound transport alternatives, for example, the appropriate mix of road/trail infrastructure.

Multidisciplinary teams, consisting at a minimum of a landscape planner, road engineer, geotechnical engineer, park ecologist, and tourism specialist, should conduct park-by-park surveys of existing and proposed road networks and segments to:

- identify portions of the existing park network that could be realigned or removed to reduce overall environmental impacts, maintain access and improve visitor experience;
- recommend cost-effective and feasible transport alternatives for portions of the existing network that would provide greater protection of exceptional resource values while also improving visitor experience, especially through the substitution of walking trails for roads;
- identify the most desirable options for increasing visitor access without adversely affecting park resources, e.g., upgrading existing roads to the most appropriate classification level, constructing trails instead of roads, using air transport, etc.;
- determine whether the parks have environmentally sound road design standards, and whether they are being used;
- provide practical suggestions for further improvements in design standards and their implementation.

In each zone, the TANAPA Planning Unit should assess the cost/benefits of the alternative of further restricting the development of new roads, given the increasing global value of wilderness and the potential for using fee structures to limit the number of visitors, while at the same time, generating higher revenues. These assessments should take into consideration that lands without roads that have been banked for possible future use are appreciating rapidly in value as “wild” attractions.

TANAPA Management (at both headquarters and the park level) should also conduct a separate assessment of the cost-effectiveness and environmental soundness of using private contractors, rather than relying exclusively on the parks’ works departments and supervised casual labor. Such an analysis is especially important in planning future major road improvements.

TANAPA should also assess the most appropriate technology and equipment to be used for road improvements. For example, most Class V roads should not be graded, Class IV roads only lightly graded, and the use of bulldozers restricted to murram extraction from quarries and construction of Class I or Class II roads.

TANAPA makes use of labor-based technology and community casual labor for maintenance of park roads, where practical and economically feasible to do so. Labor-based road construction and rehabilitation is normally done with little or no reliance on heavy equipment, and involves the use of local resources (both human and non-human). Through this approach, it is possible to develop local maintenance capability, which is very important in making road maintenance sustainable. Labor-based methods create employment opportunities and can be a source of income to adjacent local communities. It also enhances worker skills.

Many park roads/tracks can be rehabilitated as long as there are sufficient park resources to undertake the improvements properly and efficiently, without sacrificing maintenance of the existing network. In some cases, however, where roads/tracks have deteriorated beyond repair, it may be necessary to consider re-alignment. TANAPA will apply cost/benefit analysis to guide decisions on realignments versus rehabilitation.

Institutional alternatives for sound environmental design, construction and maintenance of road improvements. The institutional management approach taken in planning and implementing road improvements may also have major bearing on whether recommendations will be followed and actions taken to actually mitigate potential adverse impacts. Inadequate *Workplans* and budgets, and insufficiently trained staff with poorly defined responsibilities, can make recommended mitigation and monitoring efforts nothing more than a litany of “good intentions.” Several institutional management alternatives were considered and are discussed in Chapter 2, Section 2.2.4 of the PEA. The preferred option borrows from these alternatives and has the following characteristics:

- Responsibility for most road improvement decisions is vested in the individual park Wardens in Charge (WICs) but with some centralization at Headquarters to oversee major road works.
- TANAPA would develop standards and specifications for use of private contractors for major construction or rehabilitation activities. Similarly, efficiencies might be realized by having Headquarters develop system-wide service contracts for maintenance of heavy equipment.
- TANAPA would add staff to oversee development of *Road/Trail Network Plans*. This is likely to be a long-term, on-going need; however, it could be largely contracted out to consulting firms with landscape architecture capabilities.
- *Quarry Management Plans* can be developed under a single one-time contract, requiring limited TANAPA oversight to ensure implementation of the plans.
- The PEA Team is strongly in favor of the *Environmental Review* process and the development of annual *Environmental Management Workplans* for road improvements. The effectiveness of *Environmental Reviews* at the park level could be greatly enhanced by having a shared pool of environmental assessment and engineering expertise on call to work with the individual park Environmental Review Coordinators, Environmental Management Teams and/or Works personnel. Such a technical support system might work much the way specialized environmental services are provided to the USAID Mission Environmental Officers at the country level by the Regional Environmental Officer based in Nairobi.
- Headquarters-based expertise could be supplemented by outside consulting services, as needed.
- Headquarters environmental impact assessment staff could also conduct periodic training programs for park personnel in environmental review and environmental management of park road improvements in order to provide new staff with needed expertise, as well as to introduce additional concepts and techniques in environmental management.

No action compared to proposed actions. The proposed action offers important economic and protected area resource management benefits, as well as opportunities for environmental enhancement. By implementing the mitigation and monitoring measures identified by topic in Chapter 6 of the PEA, environmental impacts and risks can generally be avoided, diminished, controlled or compensated for. Further, unanticipated risks and impacts can be monitored, and

subsequently mitigated through implementation of the *TANAPA Environmental Management Plan Guidelines for Road Improvements*.

Under *most* circumstances, the no action alternative offers no benefits, but at the same time poses significant environmental impact risks.

Note that under *certain* circumstances, “no action” may be an environmentally preferable choice. Thus, screening and review procedures have been devised to ensure that no action can be chosen where appropriate.

Identification of preferred action. The preferred action is to carry out road improvements in Tanzania’s National Parks, with the incorporation of the following mitigative and monitoring measures:

- multidisciplinary team surveys and assessments, as outlined above under Chapter 2, Section 2.2.3 “Alternative design and management strategies for road improvements,” and Chapters 6 and 7 of the PEA;
- training in environmental screening and review, and environmental mitigation and monitoring, including application of the *TANAPA Procedures for Environmental Reviews of Road Improvements* as recommended in Chapter 7;
- development of mitigative and monitoring measures for road construction, operation and maintenance, as described in Chapter 7 and *TANAPA Environmental Management Plan Guidelines for Road Improvements*;
- development and implementation of annual park *Environmental Management Workplans* for road improvements, as recommended in Chapter 7 and specified in the *TANAPA Environmental Management Plan Guidelines for Road Improvements*;
- preparation of standards and specifications for sound environmental design and management of road improvements to be incorporated in a *TANAPA Operations Manual* for road improvements as described in Chapter 7, Section 7.3.

Description of affected environment. Chapter 3 of the PEA provides descriptions of the affected environment for the five Northern Circuit parks. Because not all locations for future road interventions covered under the PEA are known, and because of the variety of environmental situations encompassed by potential activities, the PEA provides neither comprehensive nor detailed baseline environmental information. Implementation of the recommendations for environmental screening and review in Chapter 7 will require TANAPA implementers to provide descriptions of the affected environment specific to the setting in which their activities are carried out, as part of environmental reviews preparation.

Institutional framework and regulatory setting. Chapter 4 reviews the institutional and regulatory setting affecting the PEA. Elements include existing policies, management plans and institutional arrangements that tend to support or contradict the proposed action; and assessment of the capacity and capability of various institutions to support implementation of proposed mitigation measures.

Impact analysis framework and the environmental impact matrix. Team fieldwork was carried out from Jan 31 - Feb. 18, 2000. Observations from each Park assessment are provided in *Appendix B - PEA Team Field Note Summaries*. Upon completion of fieldwork, the Team conferred on issues to be addressed under four broad categories: physical resources, ecological systems, landscape issues and socio-economics. Each issue was carefully discussed in a day long session to outline the matrix that would be used to match park road activities against the environmental and social impacts of these activities. The Team also made an effort to organize the impact list to correspond as much as possible with the headings found in Section IV of TANAPA's Development/Action/Lease Procedures (1995) Section IV *Environmental Impact Consideration Checklist*. The priority issues identified by stakeholders during the *Scoping* process were also revisited.

Methodology used in ranking significant impacts. After developing the matrix outline, the Team carried out a joint review of each road activity's impact on various physical features, ecological systems and landscape characteristics as well as the impact on socio-economics. Ranking considered the range of environmental effects, both adverse and beneficial during all four stages of road improvements: planning and design, construction, operation, and decommissioning. Consideration was also given to indirect, induced and cumulative impacts. To ensure that the full range of Team expertise was brought to bear on the ranking process, each Team member was polled in a full group session to obtain a ranking ranging from high, medium or low adverse impact as well as potential or beneficial impacts for each road activity. The Team members then reached consensus as a group on the rankings for each category of impact. The results of the exercise were compared with the priority issues identified by Stakeholder's during *Scoping*. The methodology is described in more detail in Chapter 5 and the matrix below appears in the PEA as Table 5-1. On the basis of these rankings the Team members proceeded to write the various sections of *Chapter 6. Environmental Consequences*, addressing each of the environmental impacts identified in the matrix, and placing emphasis on those having the most adverse or beneficial impacts. Mitigation measures were also developed through Team consultative discussions and joint reviews of drafts.

The evaluation of impact significance was for the most part a qualitative interdisciplinary exercise based on discussion among PEA Team members. Decisions were also based on past experiences, expert judgment and stakeholder views and concerns reflected in the *PEA Scoping Statement*.

[illegible]

Tourist Industry		●	○	●	○	●	●					
Local Economy			○	○	○							
Employment			○	○	○	○			○	○		
Risks/Hazards		●	●	●	●	●	●		●			
Dust Levels		●	●				●					
Noise Levels		●	●		●	●			○	○		
Disease Vectors					●	●						
Health		●	●		●	●						
Benefits to Communities		○	○	○	○	○						
Costs to Communities		●			●							
Benefit to TANAPA		○	○	○	○	○	○	○	○	○		
Cost to TANAPA		●	●	●	●	●	●	●	●	●		
Compatibility with Policies		●	●			●	●					
Human Settlement			●									
Socio-Economics												
Visitor Experience		●	●	○	●	●	●		○	○		
Carrying Capacity		●	●		●							
Viewshed		●	●	●	●	●	●	●	○	○		
Wilderness Quality		●	●		●	●	●	●	○	○		
Scenic Quality		●	●	●	●	●	●	○	○	○		
Landscape Issues												
Tropical Forest		●	●		●		●		○	○		
Exceptional Resources		●	●		●		●					
Ecological Function		●	●	●	●	●	●	●	●	●		
Animal Harassment		●	●		●		●					
Wildlife Migration/Movement		●	●		●		●					
Poaching		○	○		○		○					
Vegetation		●	●		●	●	●		○	○		
Alien Species		●	●		●	●						
Species Diversity		●	●	●	●	●	●	●	●	●		
Habitat Change		●	●		●	●	●		○	○		
Ecological Systems												
Ground Water Quality		●		●		●						
Ground Water Quantity								○		○		
Surface Water Quality		●	●	●	●	●	●	●	●	○		
Surface Water Quantity		●	●					○	○	○		
Wetlands		●	●	●	●	●	●	●	○	○		
Drainage		●	●		●		●	○	○	○		
Topography									○			
Hydrology			●				●			○		
Surface Runoff		●	●		●		●	○	○	○		
Soil Compaction		●	●		●		●		●			
Siltation		●	●		●		●	●	○	○		
Debris Deposition												
Soil Erosion		●	●		●		●	●	○	○		
Physical Resources												
Impacts on	Activities	Operation phase	Vehicle Traffic Movement	Road maintenance	Maintenance of machinery	Tourist activities	Waste management	Off-road driving	De-commissioning	Ripping old road	Shaping	Revegetation

Adverse Impact Level

● low
● medium
● high

Beneficial Impact Level

○ low
○ medium
○ high

Environmental consequences: significant impacts and recommended mitigation measures. Chapter 6 of the PEA contains the analysis of the most significant potential adverse environmental impacts identified by the PEA Team and summarized in the Environmental Impact Matrix. Suggested mitigation measures are presented at the same time as the analysis of each impact, so that readers are able to see the direct relationship between individual impacts and proposed mitigation strategies. This is by far the largest Chapter in the PEA. The full set of suggested mitigation and monitoring measures have also been incorporated within *TANAPA's Environmental Management Plan Guidelines for Road Improvements* which are to be used at the park level by Environmental Management Coordinators and Environmental Management Teams in preparing annual *Environmental Management Workplans* for road improvements.

Recommended Strategies for Environmental Management of Road Improvements. In Chapter 7, the PEA also addresses in some detail, institutional mechanisms needed for effective implementation of the PEA recommendations. A short description of each follows.

Development of Road/Trail Network Plans. As a component of the GMP/MZP process there should be very real benefit from carrying out new park-by-park reviews to determine how best to improve road/trail networks. In several parks, existing roads were originally created in a haphazard and unplanned manner before the parks were gazetted. Often, tracks were established by communities, hunters, researchers or commercial interests simply to get from one point to another by the shortest possible route. Many of these routes have never been questioned. While they may be heavily used, the opportunity exists to comprehensively review and suggest more environmentally sound routings. This is particularly true because most existing visitor tracks can be returned to nature with minimal investments in decommissioning. An exciting opportunity exists through network planning to adopt a "clean slate" approach to the overall design of a park's road system. Old minimal track roads could be abandoned in a systematic fashion over time and replaced by realignments or new roads that more closely follow hill contours, minimize soil erosion effects, bypass areas with black cotton soils, reduce visual impacts, and avoid coming in close proximity to exceptional resources.

At the same time, TANAPA has discovered that visitors have more lasting and pleasurable memories, and park attractions are more fully appreciated, where they are allowed to disembark from their vehicles and move on foot to visit special park features, rather than drive to them. The development of road/trail network plans would afford park staff and the TANAPA Planning Unit the opportunity to review how best to integrate roads and trails in what is becoming an increasing trend in park management planning around the world. Development of these plans will require teams with a wide variety of expertise including: landscape architecture, road engineering, park planning, ecology, hydrology, geotechnical engineering, and economics (for cost-benefit analyses). Appropriate park staff also need to be involved throughout this process.

Various strategies may be equally appropriate as a result of this planning process. However, a strategy based on piece-meal, opportunistic actions could be disastrous over time, and should be avoided. In network planning, the teams should also be charged with weighing the advantages/disadvantages and costs of other alternative forms of transport (e.g., air, water or rail) and transport equipment for moving visitors, park personnel and goods through the parks.

How Close Should Roads Come to Sensitive Ecological Systems?



Kopjes are important "islands" of biodiversity in a number of Tanzania's Parks. This is one of the Gol Kopjes in the Serengeti. To protect the unique flora and fauna of the kopjes, including bird species and leopard, it may be best not to have roads draw too near, but rather select only certain kopjes for use by visitors, to be approached on foot along established trails. This strategy implies a need for more armed park guides.

Many Park Roads Pass Too Close to Exceptional Resources



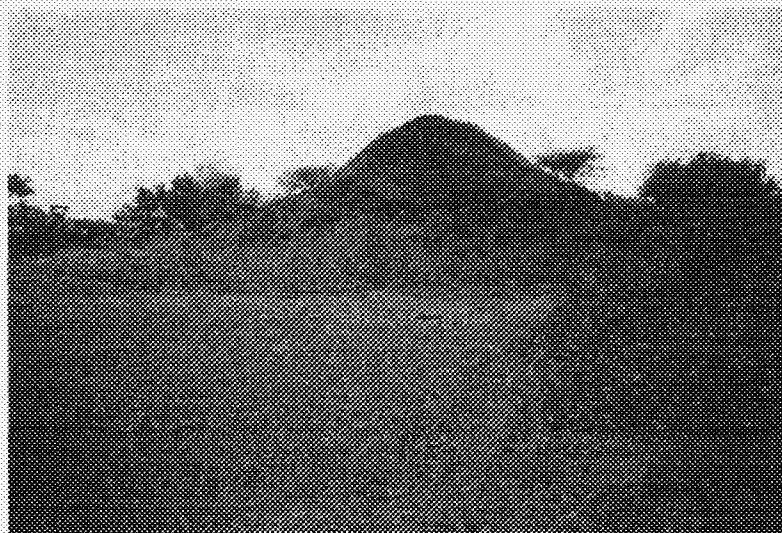
Poachers' Hide in Tarangire National Park is a hollow baobab that sleeps 20! The tree may be threatened by increased road traffic. The existing approach could be closed and replaced by a short trail starting 50 meters from the site. (S 3°57.9', E 36°1.8')

Development of Quarry Management Plans. Also, within the overall framework of GMP/MZP development, TANAPA Headquarters needs to have a specialized team review all existing and potential quarry sites and murrum pits, both inside and outside the parks, to assess the quality and extent of both current and future supplies. By knowing where the murrum resources are located, their quantity and quality, and the cost to utilize them, this specialized team could craft for each park, a phased long-term plan for provision of road surfacing materials for the park network, so as to minimize cumulative impacts on the environment from extraction.

The plans would designate the most favorable sites with the least impact on viewsheds and exceptional park features. They would also provide sufficient information on the quantity of murrum at key sites, so as to allow for much more systematic restoration of mined sites than is currently taking place. Individual site information is needed, as a component of each plan, on the method to be used to retain topsoil for future restoration of the landscape. Based on this information suggested approaches are also needed on to how best to phase reclamation at each site. As part of the Terms of Reference for the study team, the plan should incorporate site specific mitigative measures for reducing hazards and risks to workers, and if quarries exist outside the parks, potential risks and health hazards for communities. For quarries outside the parks, the team should outline how to maximize benefits to communities in the area, for example, by designing quarries to serve as water reservoirs or temporary catchment areas.

Team composition in this case might include, but not be limited to, the following expertise: geology and soils, land survey, landscape architecture, ecology, civil engineering, socio-economics and tourism. Appropriate personnel from the Works and Tourism Departments of each park should be involved in these surveys.

A Quarry Inside the Serengeti – What are the Plans for Reclamation?



This quarry at Nyankoromo in the western Serengeti has been used for many years. It is well away from visitor viewsheds. However, attention has not been paid to restoring those sections of the quarry where murrum extraction has been completed. Conducting a multidisciplinary survey of existing and potential sites for murrum extraction would be useful in determining the quantity and quality of murrum available. This information could then be used to develop parkwide plans for phased reclamation of each individual site, including restoration of stored topsoil.

A special consideration: roads and Fire Management Plans. Lightning, poachers, tourists and cattle rustlers, can start park wildfires. In addition, fires may enter parks from outside, depending on the prevailing wind direction. In some cases, they originate from traditional burning associated with the preparation of agricultural land for the next growing season.

Properly demarcated boundaries (e.g., tracks or belts of cut vegetation), roads, game-viewing and anti-poaching tracks are used as fire breaks and can assist in preventing fires from entering or leaving the parks. At present, boundary demarcation is inadequate in many parks because of lack of appropriate equipment, including graders, vehicles and tools for clearing vegetation.

In developing park *Fire Management Plans* and *Road/Trail Network Plans*, consideration should be given to the use of roads as firebreaks in strategic locations (e.g., boundary demarcations, or vegetated areas with high wind exposure), since doing so could help minimize the dual environmental impact associated with creating separate roads and firebreaks. Also, the presence of a road as part of the firebreak can be useful in slowing the regrowth of vegetation on the road surface. Road/fire break combinations can also be constructed to protect sensitive areas, experimental sites and buildings from burns.

However, because of the required clearing and road width necessary to create effective firebreaks, extensive use of roads as firebreaks could adversely affect park aesthetics. Thus road/firebreak combinations should be used judiciously.

Strategic links. The PEA Team believes this Programmatic Environmental Assessment has value beyond TANAPA. Environmentally sound design and management of protected area road systems in Tanzania will bring important benefits to the increasing portion of Tanzania's economy that depends on tourism. USAID, through its Strategic Objective Four: *Increased Micro and Small Enterprise Participation in the Economy* has an interest in Park road improvements as a component of stimulating the segment of the Tanzanian tourism industry which is composed of local tour operators and hoteliers.

More significantly, the findings from the PEA may be equally applicable to TANAPA's sister agencies, the Division of Wildlife, which is responsible for managing the Nation's Game Reserves and Game Controlled Areas, and Ngorongoro Conservation Area Authority (NCAA), which is responsible for managing the Ngorongoro Conservation Area (NCA). It is recommended that, through minor modification, much of the PEA (with its appendices and attachments) be converted to a document for use by the Wildlife Division and NCAA. Of particular value are those sections pertaining to mitigation and monitoring, use of a formal environmental screening and review process, and the format and content of the environmental management plan guidelines for road improvements. Other protected area managers throughout East and Southern Africa may also find the proposed approach to mitigation and monitoring applicable to their road improvement activities.

It should be noted that this activity also has links to USAID/Tanzania's Strategic Objective Five: *Rural Roads Improved in a Sustainable Manner*. The Environmental Screening and Review Process adopted here for implementation by TANAPA, was adapted from the process used to

screen the rehabilitation of all road segments under USAID's \$50 million rural roads rehabilitation program. Further, under USAID's Strategic Objective Five, over 1,000 Tanzanian contractors and consultants are receiving both direct and indirect assistance in the management and execution of road rehabilitation and road maintenance contracts. An important consideration for TANAPA in the future may be to weigh advantages and disadvantages of utilizing private contractors for selected road improvement works.

Building TANAPA capacity in environmental assessment.

Staffing up. The PEA Team strongly recommends that TANAPA consider adding additional EIA staff resources to the Planning Unit. A full-time specialist is needed to oversee all TANAPA EIA-related activities.

The PEA Team also recommends the designation of an Environmental Review Coordinator for each National Park and establishment of Environmental Management Teams. In most parks it is expected that the Park Ecologist will be appointed the ER Coordinator by the Warden in Charge, and that the Environmental Management Teams will consist of the ER Coordinator, the Road Manager/Inspector or Foreman, the Community Conservation Warden, the Tourism Warden, the Warden for Anti-Poaching, or other personnel whose activities may have impacts on the biophysical environment of the park. The ER Coordinator and the Environmental Management Teams will be responsible for carrying out *Environmental Reviews* of proposed road segments following the procedures developed under this PEA and found in *TANAPA Procedures for Environmental Reviews of Road Improvements*. Together, they will also be responsible for the preparation of annual *Environmental Workplans* for road improvements (identifying mitigation and monitoring measures, reporting on actions taken, outlining future follow-up required, and providing estimated budget requirements for implementation). The *Workplans* are to be prepared in time for consideration as part of the annual budget submission process, following the *TANAPA Environmental Management Plan Guidelines for Road Improvements*.

EA training. One of the results USAID/Tanzania is hoping to achieve under its SO2 is to increase the effectiveness of institutions that support natural resource management in Tanzania (IR 2.2). The thrust of this effort is to increase the skill base of individuals in targeted institutions and to promote organizational improvements directed by the institutions themselves.

The majority of TANAPA staff has only limited understanding of environmental assessment as a planning tool or of environmental issues affecting the National Parks and park management. It is therefore considered highly desirable for the Park system to institutionalize an annual five-day EA training program for those staff members who will be responsible for using the *TANAPA Procedures for Environmental Reviews of Road Improvements*. The training should also emphasize how to apply the *TANAPA Environmental Management Plan Guidelines for Road Improvements* to ensure that the mitigation and monitoring measures outlined in the PEA are implemented. This training should include developing basic familiarity with environmental and ecological principles. Special attention should be placed on effective training for the individual designated as the Environmental Review Coordinator in each Park, since this person will have lead responsibility for overseeing the preparation of *Environmental Reviews* and completion of *Environmental Screening Forms* (ESFs). Training of the ER Coordinator should also be a

priority since this person will also coordinate the preparation and yearly submission of the *Environmental Management Workplan* describing how mitigation and monitoring measures will be implemented. Training should be extended to other members of the Environmental Management Team, as appropriate. The ER Coordinators should themselves be considered future trainers.

A shorter course is also recommended for TANAPA senior staff to introduce them to environmental impact assessment concepts and steps needed to insure recommendations from the PEA are institutionalized. Because of staff turnover, this course should also be repeated periodically.

Building TANAPA road works capacity. TANAPA has been successfully constructing and maintaining roads for many years and has many skilled equipment operators and mechanics on its staff in the larger parks (i.e., Tarangire and Serengeti). Smaller parks such as Arusha and Kilimanjaro with limited road systems still carry out road repair mainly by hand, due to lack of road equipment. Distribution of road equipment and staff varies depending on each park's total road distances to be maintained, and the park's topography and soils. The capacity at TANAPA headquarters for road design and construction support appears limited.

Many of the most common adverse impacts associated with road improvements have been the result of equipment operators receiving insufficient training in how to use the equipment properly to shape the road and provide effective drainage.

Based on observations made at parks surveyed, the majority of heavy road equipment appears to be grounded at any one time, waiting for repairs. Causes of equipment breakdowns are many, with the most common causes apparently related to old equipment that is basically worn out to begin with (e.g., Tarangire and Manyara), equipment that is not suited to the job at hand (too small or large, not enough clearance, not rugged enough—BMC tippers at Serengeti), parts that are hard to find, and one-of-a-kind equipment that is difficult to repair (Fiat graders and BMC tippers at Serengeti). Mechanic shops with a full array of tools, hoists, parts storage, and repair equipment were not evident in the parks surveyed. Equipment operating and repair budgets did not appear sufficient to operate the major park equipment, (such as graders and dozers) as needed during the year or to provide for proper tools, parts, engine repairs, and basic preventive maintenance (e.g., Manyara). Records on equipment use (hour meters, kilometers driven, etc.) are apparently absent except at the largest parks such as Serengeti. Without these records it is difficult to assess when servicing of the equipment is needed. Again, a host of adverse environmental impacts are associated with insufficient road maintenance, and these problems are exacerbated by shortages of equipment needed to maintain the extensive park road networks. These shortages also constrain plans to upgrade, realign or create new roads in an environmentally sound manner.

Suggested improvements to capacity include:

- **Strengthening budgets related to park road maintenance**, especially as it relates to equipment preventive maintenance and repair. The current deficiency undermines all efforts to develop and manage TANAPA's roads in a sustainable manner. The PEA Team believes

creative application of park fee structures could provide the funding needed to support the work's departments and the PEA recommendations.

- **Timely training for equipment operators, and equipment mechanics, and an independent, unbiased assessment of the costs and benefits of establishing equipment maintenance contracts for preventive maintenance.** Of particular concern is the need for TANAPA mechanics to be able to read technical manuals for heavy equipment in English. Without this capability, maintenance of equipment with electronic controls may become a significant constraint to carrying out proposed road improvements as planned.
- **Increased sharing of road works expertise among parks.** The PEA Team noted that the knowledge of environmentally sound road management and proper equipment use and maintenance varies among individual parks and much could be learned through direct sharing of skills in on the job training. For example, skilled grader drivers in the Serengeti could be used as trainers for grader drivers in other parks. This form of mentoring can be applied to other equipment operators and mechanics. Annual equipment operation and maintenance (O&M) training for equipment operators and mechanics could take advantage of the considerable expertise that already exists in selected parks to provide training to roads works personnel in need of further skill development. **Also personnel in parks where road works skills are limited could second their employees to other parks to work in partnership with other more fully trained operators and mechanics.**
- **Training of equipment operators in environmentally sound construction, maintenance and decommissioning of roads.** Periodic training that combines best engineering practice, ecological principles and environmental issues is needed for road works personnel, especially heavy equipment operators. Standard operation and maintenance programs for equipment operators should include an environmental component with instruction from TANAPA ecologists and Planning Unit staff, and outside consultants, as appropriate.
- The TANAPA park road system may be of sufficient importance to TANAPA-wide visitor use that it may be worth establishing a **center for park roads** at some point within the TANAPA system. A centralized place for specialized staff, equipment reference, and road reference manuals and materials would be of help to the various parks. A possible source of funding for building road system capacity may be to designate a larger portion of the growth in gate fee income that should result by improving roads to increase visitor LAUs and access.
- The discipline of Landscape Architecture should be included as an integral part of the park road program, especially if the development of *Road/Trail Network Plans* is deemed a priority. Roads inside parks are different, and issues such as visual quality, visitor experience, and park road planning should strongly influence park road design, construction and repair. Involvement by Landscape Architects could be through U.S. Department of Interior (DOI) technical assistance to TANAPA, by consultants, or through TANAPA itself.

Environmental review and analysis procedures.

Screening and review.

An environmental screening and review process for proposed road segments has been devised to ensure that recommendations of the PEA will be followed and that environmental sustainability is considered for all TANAPA road improvements. The process also determines whether various provisions of USAID's Environmental Procedures are applicable. The TANAPA Planning Manager is responsible for first level review and approval, based on information submitted in an *Environmental Review* (ER). The ER is to be submitted as a part of the feasibility study for each proposed road improvement segment. Additionally, for Tarangire and Lake Manyara National Parks, the USAID/Tanzania Mission Environmental Officer (MEO) will review and approve *Environmental Reviews* submitted for all road improvements undertaken using USAID purchased road equipment. At Tarangire and Lake Manyara National Parks, no irreversible commitment of resources can be made for proposed road improvements, until MEO approval has been received. The results of these *Environmental Reviews* will also be used to focus subsequent environmental analysis that might be warranted. These are described in Chapter 7, Section 7.2.2.

As a prerequisite to site selection and design of road rehabilitation activities, training in environmental assessment methods and mitigative measures is required for TANAPA engineers, road inspectors, ecologists and planners at both the individual park and headquarters level.

USAID and AWF are encouraged to work closely with TANAPA to develop mechanisms to ensure that the environmental issues associated with road improvements are determined and addressed at the early design stage, prior to initiating road improvements, so as to avoid potentially costly errors during implementation.

As mentioned above, the procedures to be employed incorporate a series of guiding questions within an *Environmental Screening Form* (ESF), to elicit answers concerning the environmental characteristics and potential environmental impacts of proposed road improvement segments. Use of the ESF and completion of the *Environmental Review* is to be under the overall direction of the Environmental Review Coordinator in each park.

The ESF developed for this PEA has been reviewed by USAID's BEO, REO and the MEO and deemed acceptable for use in conducting environmental reviews of TANAPA road improvements. Because this screening and review process is new to TANAPA staff, the *Procedures for Environmental Reviews* have been labeled a "*Working Draft*." They are to be reviewed and finalized after each park has had an opportunity to field-test them for a full year.

The ESF also incorporates filter questions to provide information concerning threatened/endangered species, their habitat, biodiversity, tropical forests, introduction of exotic species, and effects on exceptional park resources. Environmental Review Coordinators in each park and reviewers will require sufficient information to reach key determinations regarding these issues.

Summary of TANAPA Procedures for Environmental Reviews of Road Improvements.

The Procedures are outlined in three sections: Part 1 contains the Approval Facesheet for an *Environmental Review* and an *Introduction to the Environmental Screening and Review Process* that helps the preparer determine what type of review is required for four levels of road improvement environmental impacts. Part 2 provides a series of leading questions to guide *Environmental Review* preparers and outlines the expected contents of any *Environmental Review*. Part 3 explains, in general, the roles and responsibilities and key steps in preparing an *Environmental Review*.

Each park is responsible for the completion of an *Environmental Review* of each proposed road improvement segment. The Facesheet must be completed by the park's designated ER Coordinator for all four levels of *Environmental Review* and signed by the Park ER Coordinator, Road Manager/Road Inspector and Park Warden in Charge.

The four levels of road improvement activities and the type of road improvement analysis required are described below:

TANAPA Level 1: No foreseeable adverse impact on park resources. Under *Level 1*, no further environmental review or action may be necessary. The Park ER Coordinator completes the form and ER facesheet providing the *Level 1* justification. The Park Road Manager/Road Inspector and the Park Warden in Charge must also approve by signing and dating the completed facesheet. An informational copy of the completed and signed ER is then sent to the TANAPA Planning Manager. Nevertheless, even if the ER Coordinator finds the proposed road improvement activity falls under *Level 1*, he or she should still consider whether the activities may require some mitigation or monitoring to guard against possible adverse effects. The ER Coordinator should also consider steps to enhance beneficial effects and describe these as part of the *Level 1* summary.

TANAPA Level 2: Adverse environmental impacts possible. Environmental Review is required under *Level 2* and specific conditions, including mitigation and monitoring, may be applied. Activities requiring *Level 2* Environmental Review, might include: minor construction or rehabilitation of park roads less than 10km in length (with no change in alignment or right of way); activities where ecologically sensitive areas or exceptional resources are at least 200m away from the road and not affected by construction or changes in drainage; no relatively undegraded forest within 5km of the road.

The *Environmental Review* must address why there will be no potential adverse impacts on sensitive areas or exceptional resources, endangered or threatened species or their critical habitat; relatively undegraded forest or species diversity, i.e., justify the conclusion that the proposed *Level 2* activities do not belong in *Level 3* or *4*. Even for activities designed to protect or restore natural resources, the potential for environmental harm exists (e.g., introduction of exotic species, effects of road improvement on the growth strip settlement outside parks, etc.). If there is no exact match for the activity being proposed, and it is not in *Level 1*, *3* or *4*, then the preparer is to treat it as *Level 2* for purposes of environmental review.

The distances provided above as criteria should be considered only approximate guidance. The expert judgment of the ER Coordinator and others must be applied to determine whether a road improvement impact is significant enough to require more than a *Level 2* review. For example, certain exceptional resources or sensitive habitats could be significantly affected even if the road is more than 200 m from the site. Conversely, other exceptional resources can have roads approaching closer than 50 m with no adverse impacts.

Nevertheless, if roads pass closer to undegraded forests than 5 kms or within 200 meters of exceptional resources, strong justification must be provided in the *Environmental Review* for why a *Level 2 Environmental Review* will suffice, outlining how impacts will be mitigated and monitored.

The same is true for consideration of road length, since under certain circumstances even a ¼ kilometer road improvement could have very significant impacts. For example, in Arusha National Park, upgrading a short stretch of road passing between two of the Mornella Lakes could potentially affect the flow of underground water feeding them, and subsequently alter their ecological conditions. (When in doubt about significance of impacts, multidisciplinary expertise is to be used to arrive at decisions, in consultation with the TANAPA Planning Manager.)

TANAPA Level 3: Significant environmental impacts likely. These may include road improvement activities such as: new road construction, or realignments or major upgrades of a park road over 10km in length; any proposed new, realigned or upgraded roads which would pass through or near sensitive ecological areas, wetlands, or relatively undegraded forest lands within 5km of the road; any proposed new, realigned or upgraded roads which might jeopardize threatened or endangered species or adversely modify their habitat (especially wetlands, any proposed road improvement that might adversely affect part biodiversity, tropical forests); any proposed new, realigned or upgraded roads which would pass through or near other exceptional resources closer than 200m from the road; any proposed new, realigned or upgraded roads with potential to introduce exotic flora or fauna.

Level 3 activities are consistent with TANAPA criteria for activities that normally require a TANAPA Environmental Impact Assessment (EIA) and a USAID Environmental Assessment (EA). It is recognized that deciding whether such assessments are needed may be open to debate and require multidisciplinary judgement. The TANAPA Planning Manager must ultimately decide whether an activity falls within *Level 3* and will require an TANAPA EIA. For Tarangire and Lake Manyara National Parks, the decision on whether a USAID EA will be needed rests with the USAID MEO, REO and BEO. following the procedures outlined in 22 CFR 216. 3(a)(4) and 22 CFR 216.6. In this document we refer to both the TANAPA EIA and the USAID EA as a *Supplemental Environmental Assessment (SEA)* as described in Chapter 7, Section 7.2.3.

For Tarangire National Park and Lake Manyara National Park, if the particular road improvement under consideration "will have the effect of jeopardizing an endangered or threatened species or adversely modifying its critical habitat ..." (22 CFR 216.5), then an Environmental Assessment (EA) should be prepared following USAID environmental procedures.

TANAPA Level 4: Activities not fundable (or fundable only when specifically defined findings to avoid or mitigate the impacts are made, based on an Environmental Assessment). These activities include: road improvements determined likely to significantly degrade park resources and values, such as damage to sensitive ecological areas or exceptional resources; introduction of exotic plants or animals; road improvements determined likely to jeopardize threatened and endangered species or adversely modify their habitat (esp. wetlands, tropical forests); or construction, upgrading or maintenance of roads which pass through relatively undegraded forest lands.

For Tarangire National Park, and Lake Manyara National Park, USAID environmental procedures apply pursuant to Sections 118 and 119 of the U.S. Foreign Assistance Act.

Satisfactory completion of the ESF will require appropriate road reconnaissance and descriptive data to adequately identify the potential for environmental impacts or lack thereof. A vicinity map and more detailed map(s) or descriptions will also be required. Accurate sketch maps may be sufficient under circumstances where cartographic maps are not available.

During completion of the ESF, it will be critical for preparers to understand that if the answer to any question is unknown, effort should be undertaken to obtain available information and/or to consult with other agencies, researchers or knowledgeable individuals. In particular, gathering of information and consultation with the Planning Manager, or with other TANAPA Headquarters technical specialists (e.g., the Chief Engineer or Ecologist), may be necessary. Additional information may be available through AWF in Arusha, the Institute of Resource Assessment (IRA) of the University of Dar es Salaam, and the USAID/MEO, or from other relevant government agencies. For example, IRA staff has been involved in several environmental assessment activities in Tarangire, Lake Manyara and Serengeti National Parks. They have extensive resource materials on the physical, ecological and surrounding socio-economic environments of these parks, as well as specialized land-use maps.

Lack of information in the ESF may unnecessarily trigger an environmental assessment, as specified in Chapter 7, Section 7.2.3, and cause delay in the initiation of road improvement activities.

During road reconnaissance, ESF preparers may identify locations that are environmentally unique, unusual or unusually sensitive and worthy of protection, e.g., a significant wildlife habitat, a critical part of a watershed, an undegraded or dense forest, a significant wetland or the like, not yet formally protected under a GMP or MZP. Similarly, critical environmental issues may also be encountered. To ensure that opportunities to enhance protection are encouraged and pursued, issues of this type should be brought to the attention of the TANAPA Planning Manager for further consideration. The Planning Manager should have a mechanism in place to receive and evaluate this information and to provide feedback on what levels of protection from development, if any, are appropriate.

Review of Environmental Screening Form. The TANAPA Planning Manager will review a completed ESF for a particular road improvement segment to determine completeness. If complete and no significant harm is identified, the Planning Manager will approve the ESF. For

Tarangire and Lake Manyara National Parks, copies of ESFs will be sent from the Planning Manager to the USAID/Tanzania MEO, who will also review the ESF and will approve if no significant harm is identified per 22 CFR 216.1(c)(11). Alternatively, the ESF may require revision and/or more information. In such instances, the TANAPA Planning Manager will prepare a specific scope of work (SOW) for appropriate follow-on analyses. The Planning Manager must return the ESF to the preparer within 30 days, with specific instructions on how to proceed. Similarly for Tarangire and Lake Manyara National Parks the USAID/Tanzania MEO will review and approve the SOW for follow-on analysis within 30 days.

As part of the review procedure for environmental screening and any subsequent analyses, TANAPA or the USAID Mission may wish to share information with the National Environmental Management Council (NEMC). For example, information copies may be submitted, and at the TANAPA Planning Manager's discretion, guidance or advice solicited.

Review requirements.

Under TANAPA *Level 1* environmental review, no further environmental analysis will be necessary.

Road improvements that fall under TANAPA *Level 2* will have the following requirements:

- Mitigation and monitoring measures will be drawn from the *TANAPA Environmental Management Plan Guidelines for Road Improvements* and a *TANAPA Standard Operations Manual*. The *Environmental Management Plan Guidelines* have been prepared in conjunction with this PEA. The *Standard Operations Manual* should be prepared following the outline recommended in Chapter 7, Section 7.3.1.
- Park-specific mitigation and monitoring measures will also be needed for individual road improvement segments which should supplement those identified in the *Environmental Management Plan Guidelines* and be incorporated in each Park's annual *Environmental Management Workplan* submissions for road improvements (See Section 7.3.2).
- General or specific monitoring procedures will be developed, where applicable, as described in Sections 7.3.3 through 7.3.5 or as contained in the *TANAPA Environmental Management Plan Guidelines for Road Improvements*.
- Standardized mitigative measures and monitoring procedures will be developed in consultation with the TANAPA Planning Manager.
- If private contractors are to be used, these standards and identified mitigation and monitoring measures will be incorporated into solicitations, specifications and construction contracts.
- The TANAPA Chief Engineer will review final design drawings or other specifications to ensure that appropriate mitigative measures are duly incorporated.
- In the event of a TANAPA *Level 2* outcome, procedures described in Section 7.2.2 will be followed for a focused Environmental Review, if needed.

In the event of a *Level 3* Outcome, procedures described in Section 7.2.3 will be followed, and for Tarangire and Lake Manyara National Parks, notification will be made in accordance with 22 CFR 216.3(a)(9) that new information has become available.

In the event of a *Level 4* outcome, no follow-up is necessary.

Focused Environmental Review. The objective of focused *Environmental Review* is to follow-up on significant, unanswered questions and issues raised in the screening and review process. In some cases, the analysis will concentrate largely on specific mitigative measures in order to avoid or reduce adverse environmental impacts. In other cases, the analysis will identify specialized monitoring techniques (e.g., where mitigative measures need to be examined periodically, or where monitoring is desired because the particular extent of an impact depends on unknown and uncontrollable factors).

In other instances, the analysis will focus on specific issues that need to be investigated in greater detail. For example, if the likelihood of jeopardizing threatened or endangered species cannot be ruled out at the screening stage or an expert determination of "undegraded forest" is needed, the environmental analysis would examine those issues. In these cases, it is presumed that the focused *Environmental Review* will also address mitigative measures and monitoring needs that might be specific to the issue investigated.

The format and basic contents of the *Environmental Review* have been standardized and are outlined in the *TANAPA Procedures for Environmental Reviews of Road Improvements*. The TANAPA Planning Manager will re-examine the *Procedures for Environmental Reviews*, in consultation with the responsible preparers, after a year of trial use, to determine if modifications are needed. For Tarangire and Lake Manyara National Parks, the USAID MEO will conduct a re-examination in consultation with the Planning Manager.

Evaluation and approval of Environmental Reviews. At the Planning Manager's discretion, outside expertise from the University of Dar es Salaam, NEMC, etc., may be asked to evaluate *Environmental Reviews* in an advisory capacity. For Tanzania and Lake Manyara National Parks, the USAID MEO also oversees the reviews and may ask for the staff of both TANAPA and NEMC to assist with analysis.

After the analysis is completed, the TANAPA Planning Manager will approve or determine that additional documentation is required. Critical to the review process will be whether unanswered questions stemming from the ESF have been answered, whether sufficient, appropriate and cost-effective mitigative measures are specified by location and timing and whether appropriate and feasible monitoring procedures are described. For Tarangire and Lake Manyara National Parks, USAID will also review the analysis and be required to approve or to determine if additional documentation is needed. The MEO is encouraged to request REO and BEO assistance, as appropriate.

Results and next steps. The results of the *Environmental Review* are expected to provide sufficient information so that one of the following determinations can be made:

- 1) The road improvement for the proposed segment is approved, as no significant adverse environmental impacts are expected and no significant questions remain unanswered. Assuming other TANAPA-mandated requirements are in place, the improvement can proceed, with the provision that mitigative measures are clearly specified and monitoring

procedures have been agreed to and are being implemented (within annual *Environmental Management Workplans* for road improvements). Mitigation and monitoring techniques will be of the type normally associated with standard road maintenance and rehabilitation (see Chapter 7, Section 7.3.1). Responsibilities for implementation of mitigation and monitoring must also be specified and agreed to in the *Workplans*. If outside contractors or consultants are used, the procedures should be incorporated in solicitations and construction contracts. For Tarangire and Lake Manyara National Parks, the MEO will determine whether USAID-mandated requirements and procedures are also being satisfactorily followed.

- 2) The road improvement segment requires additional focused environmental analysis, the subject and purpose of which should be clearly specified on the ESF facesheet.
- 3) The road improvements segment is revealed to have potentially significant adverse environmental impacts, such as jeopardizing an endangered or threatened species or adversely modifying critical habitat, or passing through relatively undegraded forest land. In this case, a *Supplemental Environmental Assessment (SEA)* to the PEA is necessary and will be conducted pursuant to TANAPA's EIA policy. For Tarangire and Lake Manyara National Parks the procedures specified in USAID's Regulation 216 apply as outlined in PEA Chapter 7, Section 7.2.3. The MEO, REO and BEO decide whether an SEA will be required.
- 4) TANAPA will choose, based on the results of the review, not to undertake that particular road improvement. The road improvement will not proceed or be funded, because significant adverse impacts require a SEA, or they cannot be mitigated, or they are prohibited under TANAPA or national policy. For Tarangire and Lake Manyara National Parks, under this option USAID will choose to disapprove the use of USAID funds or USAID-funded equipment for the road segments in question. The MEO and BEO make this determination, taking into account the provisions of Regulation 216 and the various provisions of Section 118 and Section 119 of the U.S. Foreign Assistance Act. The REO should also be involved in the review.

In the event of the first outcome, procedures to be followed will include those described in Chapter 7, Sections 7.3.1 through 7.3.4. If an SEA is deemed necessary, TANAPA SEA procedures will be followed as described in Section 7.2.3. In the case of Tarangire and Lake Manyara National Parks, procedures of Regulation 216, also described in Section 7.2.3, will be followed.

If TANAPA decides not go forward with the proposed road improvement, no further analysis will ensue. For Tarangire and Lake Manyara National Parks, if USAID/Tanzania decides not to allow use of USAID-funded road equipment, no further action is necessary.

Supplemental environmental assessment (SEA). Should the determination be made that an SEA is required for improvement of a specific park road segment, a Scope of Work particular to the road segment will need to be prepared, indicating the issues of concern identified during screening and analysis. The SEA must be carried out following TANAPA procedures for environmental assessments, including the requirements for carrying out initial scoping and preparation of a *Scoping Statement*. Scoping and circulation of a *Scoping Statement* are described

by NEMC. If an SEA is required, the TANAPA Planning Manager will organize it. For Tarangire and Lake Manyara National Parks, USAID environmental procedures must also be followed and are contained in Regulation 216.3(a)(4). The USAID/Tanzania Mission will contract for environmental assessment services directly. Maximum participation of Tanzanian consultants and professionals is advised.

Consultation, Review and Clearance. Consultations between TANAPA and NEMC are expected, both in the early stages of SEA preparation and on the results and significance of the completed SEA. The TANAPA Planning Manager and the Director General must review and clear the PEA. For Tarangire and Lake Manyara National Parks, USAID and Tanzanian Government consultations are also expected. USAID's Regulation 216 encourages USAID to have the host country make the SEA available to the general public. The BEO must review and clear the SEA. The USAID Environmental Coordinator in Washington, D.C. may also review it. In the particular case of a road improvement SEA stemming from the process outlined in this PEA for Tarangire and Lake Manyara National Parks, the REO should also review the document.

Recommendations for development and implementation of mitigative measures.

Standard mitigative practices for road improvements: Practices to mitigate potential, direct environmental impacts must be incorporated within TANAPA operating procedures (or where private contractors are used, into solicitations, specifications and contracts) in order to ensure that mitigative measures will be implemented. An additional objective is to strengthen TANAPA internal expertise, as well as TANAPA's ability to acquire outside expertise in environmentally sound road improvement practices and mitigation.

Development of standard practices. For TANAPA road improvements one can not overemphasize the importance of: controlling erosion; proper compaction and stabilization of the subgrade and subbase of the road; installation of proper drainage; and effective routine and periodic maintenance. TANAPA is encouraged to seek the advice of soil scientists or geotechnical engineers familiar with local conditions to assist in road design, rehabilitation, maintenance, and decommissioning.

TANAPA will develop, adapt, or adopt from other sources, standardized sets of specifications for environmental mitigative measures that will be part of design specifications and which might also be used for any future private contracts to be awarded. TANAPA will develop an *Operations Manual*, containing sample plans and technical specifications and other documentation to be used internally, or which can be incorporated into solicitations and contracts; plans and technical specifications for engaging outside contractors, engineering or specialized consulting expertise. The suggested target for TANAPA's completion of the *Operations Manual* is the first quarter of 2002.

TANAPA engineering staff will develop the standard specifications for the *Operations Manual* in consultation with the TANAPA Chief Ecologist and the TANAPA Planning Manager. It is recommended that the MEO also be consulted in developing the procedures and that at the discretion of the MEO, the USAID REDSO engineer and REO also assist in the review of the procedures to be adopted.

For preparation of possible private contracts, the preparers of these standard specifications are urged to consult *Roads and the Environment: A Handbook* (World Bank, 1997), which include sample contract clauses regarding many of the topics listed below.

The *Operations Manual* will incorporate technical specifications, including, but not limited to the following:

- erosion control and stabilization structures, such as intercepting ditches, gutters, spillways, terraced or stepped slopes, riprap, vegetation, and retaining structures (gabions, cribs) or retaining walls;
- drainage features or structures for surface runoff and storm water based on flood history, including intercepting ditches, flood basins, settling basins and infiltration ditches where pollutant control may be needed;
- methods to reduce the runoff velocity on the downstream side of roads crossing waterways, e.g., rock, brick or concrete cut-off walls;
- protection of base of bridge abutments or columns against erosion;
- means to avoid filling or draining wetlands;
- tree removal and vegetation clearing practices, including provisions for utilization of cut materials and planting of trees along right of way as a standard practice;
- siting and methods of working and restoring borrow pits and quarries;
- stockpiling of soils during roadbed preparation, including location, storage procedures and reutilization;
- limitation of earth moving to dry season periods;
- revegetation or new plantings of outer portions of road right of way (where appropriate), exposed slopes (or other provision for stabilization), quarries, borrow pits, haul roads, construction staging areas, construction camps or any other areas where vegetation is removed or disturbed;
- requirements for appropriate reinstatement of land used temporarily, to ensure future sustainable use;
- construction camp and worker-related practices, including siting, design and operation of camps and facilities (specifically sanitation, water provision); procedures to avoid creating stagnant water bodies; solid waste disposal, prohibitions on clearing trees for fuelwood or other purposes; provision of alternative fuels to minimize demand on local fuelwood resources; prohibitions on poaching of animals; provision of health facilities and worker health education;
- soil erosion and sedimentation control practices, including requirement for a soil erosion and sedimentation control plan, with provisions for protection of drainage channels, installation of sedimentation basins, seeding or planting;
- dust control measures;
- protection of surface and underground water quality and wetlands through appropriate drainage practices and control of sedimentation and pollutant runoff from construction equipment or other materials;
- procedures for recovery and reuse/recycling of motor oil, lubricants and similar materials utilized during construction, operation and maintenance;

- procedures defining responsibilities of companies and workers who discover buried historic or archaeological resources, including stop-work and contact names, and penalties for damage to known sites;
- construction traffic management, so as to minimize effects of any detour sections;
- noise attenuation for inhabited areas (where appropriate) and to protect workers from excessive noise exposure;
- regular work site clean up;
- environmental training for road inspectors, engineers, foremen and equipment operators;
- Terms of Reference for *TANAPA-wide Road/Trail Network Plans*;
- Terms of Reference for a *TANAPA-wide Quarry Management Plan* with procedures for implementation.

In addition, the *Operations Manual* will specify when the procedures are applicable, i.e. during design, construction, road operation and maintenance, or decommissioning.

The *TANAPA Environmental Management Plan Guidelines for Road Improvements (Working Draft, 2001)*, developed and provided with this PEA as a separate document, contains the recommended mitigation and monitoring measures identified by the PEA Team.

Implementation of standard practices. TANAPA will require the development of annual *Environmental Management Workplans* for road improvements for each park, outlining responsibilities and timelines for implementation of mitigation and monitoring measures. A similar plan will developed, outlining TANAPA Headquarters responsibilities. Sample tables for these *Workplans* are contained in the *TANAPA Environmental Management Plan Guidelines for Road Improvements*.

TANAPA may also wish to develop standard language requesting information from contractors and firms regarding their environmental capability and experience, particularly in mitigation of impacts. This information could be used, when appropriate, to help in developing Terms of Reference, standards and specifications for possible use of outside contractors, engineering firms, and technical expertise.

Road segment-specific mitigative measures. As mentioned under Chapter 7, Section 7.2.1 (Results of ESF review and next steps), TANAPA Park Management will be responsible for developing park-specific mitigation and monitoring measures and specific road segment procedures and specifications, based on the ESF and any subsequent focused *Environmental Review*. Some of these may be variations on the more general design, construction practices and restoration procedures listed in Section 7.3.1 above, and the more specific list of mitigative measures contained in the *TANAPA Environmental Management Plan Guidelines for Road Improvements*. These will need to be tailored to characteristics that are unusual or unique, e.g., Momella Lakes in Arusha, kopjes in the Serengeti, Poacher's hide in Tarangire, Groundwater Forest in Lake Manyara, relatively undegraded forests, wetlands, specific geological and soil conditions, presence of wildlife, vegetation characteristics, exceptional features, and the like.

A number of road-specific mitigative measures need to be incorporated into design specifications, for example, bridge design or drainage system design. Improper drainage with

consequent erosion is one of, if not typically, the most damaging environmental consequence of road construction and maintenance. Road design must also incorporate measures to avoid interfering with crossdrainage and the movement of water so that the productivity of wetland ecosystems is maintained.

Where impacts on natural ecosystems are to be mitigated, the advice and services of ecologists, hydrologists, geologists and other specialists will be necessary to devise mitigative measures, not all of which may be structural in nature. For example, if wetlands impacts are unavoidable, it may be appropriate to provide protection to other wetlands as compensation. Similarly, in the instances where mitigative measures are necessary for social and community-related impacts, the advice and assistance of social scientists may be appropriate.

Specifications for road-specific mitigative measures will follow the same review procedures as those for standard mitigative practices. In the development and or review of road-specific mitigative measures for Tarangire and Lake Manyara National Parks, the MEO is urged to draw upon the advice and assistance of the USAID REDSO REO and Regional Engineer, as needed.

The park-specific mitigation and monitoring measures, including all indirect and induced impacts, should also be incorporated in each Park's annual *Environmental Management Workplan* submissions for road improvements, along with budget estimates for their implementation.

Recommendations for development and implementation of monitoring. Three types of environmental monitoring need to be distinguished and all will be needed to ensure that sound environmental road design and operation have been achieved and that TANAPA's long-term development goals are being achieved in an environmentally sustainable manner:

- 1) standard construction-related and road operation and maintenance monitoring will largely require engineering expertise. These monitoring requirements should be made part of the *Operations Manual* with annual surveys conducted by the park Environmental Review Coordinator and the Road Manager/Road Inspector, or incorporated into regular park monitoring procedures on a case-by-case basis;
- 2) specialized monitoring of specific mitigative measures as a result of recommendations in the ESF, focused environmental analysis or SEA. Tailored expertise will be required to determine if the mitigation is achieving its intended objectives; and
- 3) long-term monitoring of the environmental effects of indirect and induced development.

Standard road construction, operations and maintenance monitoring.

Development of standard road construction, operation and maintenance monitoring procedures. The TANAPA Planning Manager in consultation with the TANAPA Chief Engineer and Chief Ecologist will develop generic, road construction, operations and maintenance monitoring procedures. For Tarangire and Lake Manyara National Parks, the Planning Manager and/or respective TANAPA personnel will consult the MEO in the development of standardized monitoring procedures to be incorporated into the *Operations Manual*. USAID/Tanzania may

also wish to draw upon the advice and assistance of the REDSO REO and/or Regional Engineer for the completion of this task.

Selected TANAPA Engineering Staff, under the direction of the TANAPA Planning Manager, will have responsibility for monitoring of construction activities and the installation of design components to ensure that environmental specifications are being followed.

Environmental oversight of road improvements will also need to be assured, most likely by the individual Environmental Review Coordinators and the Park Road Manager/Inspector or Foreman. Yearly *Environmental Management Workplans* for road improvements will be required as part of the development of the *Annual Work Plan* for each park's roads, typically prepared by the Works Department for annual budgeting purposes.

Some mitigative measures will require frequent oversight. For example, initially the survival and vigor of erosion control plantings need to be monitored frequently. In addition, adequacy of drainage structures and erosion control measures, success in restoration of borrow pits, quarries or spoil sites, and other mitigative measures need to be examined to determine if they are achieving their intended effects. It is also recommended that drainage structures be inspected regularly after rain. To the maximum extent road foreman and workers should be given these more routine monitoring responsibilities as an integral part of their maintenance responsibilities.

Training by TANAPA may be required for park ecologists and road works personnel in how to monitor adequacy or effective performance of mitigative measures. TANAPA, with possible USAID assistance, is encouraged to provide such training.

It is recommended that monitoring data and information be compiled and submitted as part of a park's annual *Environmental Management Workplan* for road improvements. This should include data and information on factors closely related to road usage and necessary to determine the effectiveness of maintenance and mitigation actions, such as correct shaping and drainage, control of gulleying, etc. As part of the monitoring process, composition and volume of traffic will also need to be monitored at least annually. The *TANAPA Road Improvements Operations Manual* will list the types of monitoring to be performed for road improvement operations.

In addition, information concerning the success or failure of construction phase mitigative measures, the short-term viability of restoration activities and road design features, and the results of road surveys shall be reported in writing to Park Management in monthly or quarterly reports.

Implementation of monitoring procedures. Monitoring at the park level shall be the under the direction of the Environmental Review Coordinator, who shall ensure that necessary ecological and socio-economic data is provided and that engineering-related data and information is submitted by the Road Manager/Inspector and/or Road Foreman. The TANAPA Planning Manager will have responsibility for ensuring that park monitoring plans are implemented, drawing upon the TANAPA Senior Ecologist and TANAPA Chief Engineer.

Monitoring of long-term cumulative impacts. It is particularly important as part of the GMP/MZP process to ensure that both the planning of road improvements, mitigation measures and monitoring plans take into account possible long-term cumulative impacts on the environment. This task falls primarily on the shoulders of park ecologists, in consultation with the TANAPA Chief Ecologist and the TANAPA Planning Manager. The importance of establishing reliable baseline data on park ecological systems and of tracking key environmental indicators and proxies for this purpose, deserves special emphasis here. This information should be an integral part of the periodic evaluation of *Park Road/Trail Network Plans* and activities.

Board of Surveys environmental auditing.

The **Board of Surveys' annual park auditing process could serve a valuable function by incorporating, as a member of their survey teams, an individual who would be responsible for determining the effectiveness of road improvement mitigation and monitoring in each park.** This individual's role would not be to enforce implementation, but rather to determine how mitigation and monitoring is working and how further improvements might be made.

Contact List

Richard Engle
Park Roads Program Coordinator
Pacific West Region
National Park Service
U.S. Department of Interior
Tel: (206) 220-4274
Fax: (206) 220-4159
e-mail: richard_engle@nps.gov

Wes Fisher
Tellus Institute
USAID/AWF Consultant
U.S. Tel (617) 266-5400
U.S. Fax (617) 266-8303
U.S. Tel (978) 562-3549
e-mail: wfisher@tellus.org
wesfisher@aol.com

Carl Gallegos
Bureau Environmental Officer
AFR/SD/ANRE
Bureau for Africa
RRB4.06-112
Washington, D.C. 4600
Tel: (202) 712-5535
e-mail: cgallegos@usaid.gov

Emmanuel Gereta
TANAPA Senior Ecologist
Tel: 255-57-3471/4082
0811-654361
e-mail: tanapa@habari.co.tz

Gilbert Kajuna
Mission Environmental Officer
USAID/Tanzania
P.O. Box
Dar es Salaam
Tanzania
Tel: 051-117539 up to 45
Fax: 081-116559
e-mail: gkajuna@usaid.gov

Joseph Kessy
TANAPA Senior Park Planner
Tel: 255-57-3471/4082
Mbl: 0811-511631
e-mail: putanapa@yako.habari.co.tz

Allan Kijazi
African Wildlife Foundation
P.P. Box 2658
Arusha, Tanzania
Tel: 057-4453 or 057-2226
Fax: 057-4453
Mbl: 0811-512346, 0811510933
e-mail: akijazi@awf-tz.org

Walter Knausenberger
Regional Environmental Officer
REDSO/ESA
P.O. Box 30261
Nairobi, Kenya
Tel: 254-2-862400/02 ext 2267
Fax: 254-2-860949
e-mail: wknausenberger@usaid.gov
wijk@aol.com

Zafarani Athumani Madayi
National Environmental Management Council
Dar es Salaam, Tanzania
Tel: 255-51-121334
Mbl: 0811-340049
e-mail: nemc.crossborder@twiga.net
zmadayi@hotmail.com
zafa-virgo@mollymail.com

Raphael Mwalyosi
Institute of Resource Assessment
University of Dar es Salaam
Tels: 255-22-2-410144
255-22-2-410501/8 ext.2320
mbl:255-0811-61-3284
e-mail: sanmumwal@hotmail.com

Ishael Varoya
Chief Road Inspector
Serengeti National Park
Tel: 255-57-3471/4082
0811-654361
e-mail: tanapa@habari.co.tz